APPENDIX H

CORRIDOR ALIGNMENT SCREENING

This document identifies the multiple alignment options that were considered for each of the Stream candidate corridors and uses a high-level evaluation to score and screen alignments that were later advanced for further consideration.

M E M O R A N D U M

To: **Darin Stavish**

From: **Nelson\Nygaard Project Team**

Date: **January 13, 2022**

Subject: **Alignment and Termini Options**

The purpose of corridor screening is to identify a single representative alignment for each SSES candidate corridor. This memo identifies the corridor alignment options and how they will be screened. Only one alignment per corridor will be put forth into the evaluation. Alignment options came from the TAC, review of existing plans, and professional judgment (how routing could be optimized for speed, reliability, and passenger experience).

Figure 1 shows the process for how opportunities will be screened and evaluated.

**Figure 1   Corridor Definition and Evaluation Process**
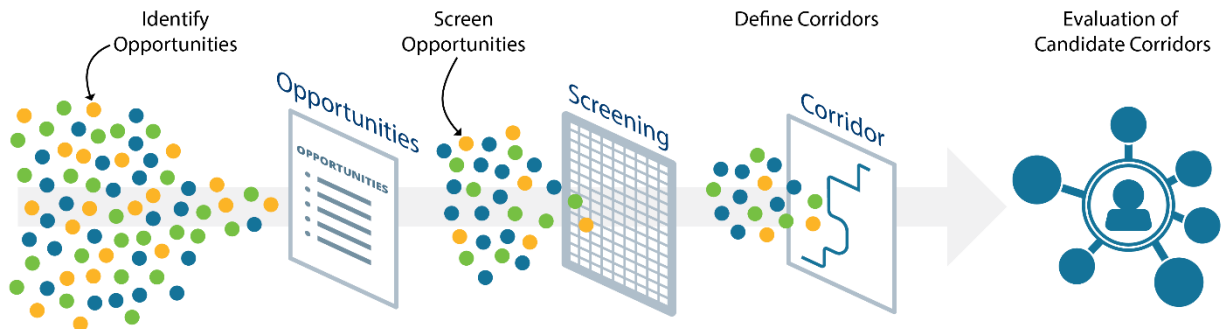
CORRIDOR OPTIONS

Opportunities vary along the corridors therefore each corridor was divided into three segments, with up to three options for each segment. The existing alignment is included as an option as well, to provide a baseline for comparison in screening (see Screening of Alignment Options section for more detail). Some segments have no options as there are no alternate alignments identified.

Corridor A

Corridor A Segments
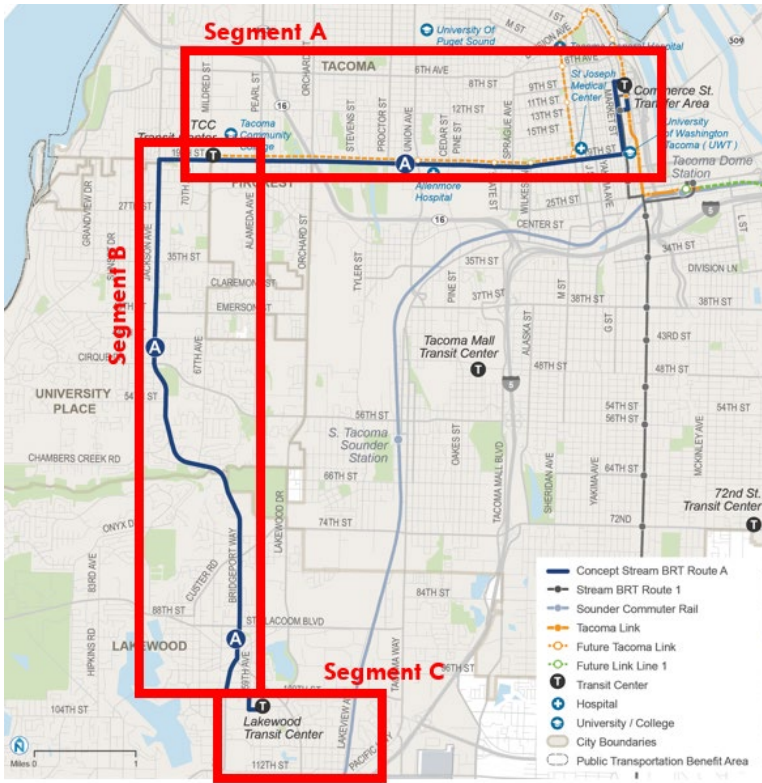
Corridor A Segment A: Alignment Options

Segment	Extents	Option	Alignment	Description
A	Downtown to TCC	-	19th Street	Existing alignment (Route 2). No changes proposed.

Corridor A Segment B: Alignment Options

Segment	Extents	Option	Alignment	Description
B	TCC to Lakewood TC	-	Bridgeport Way	No proposed changes

Corridor A Segment C: Alignment Options

Segment	Extents	Option	Alignment	Description
C	Lakewood TC to potential southern terminus	1	Bridgeport Way – Pacific Highway - Lakewood Sounder Station	Lakewood Sounder Station daily ridership: ▪ 402 (2019) ▪ 2,200 (2050 projection)
		2	Bridgeport Way to Springbrook neighborhood	▪ Stream turnaround may be challenging given the street network. Stream would need to avoid going south of McChord drive and getting stuck in security gate traffic. ▪ Turnaround opportunity along San Francisco Avenue and Addison Street.
		3	Bridgeport Way - Pacific Highway – Gravelly Lake Drive - I-5 – Union Avenue	▪ One-way service on Union Avenue. ▪ Northbound Stream would get on I-5 at Berkeley/ Jackson Avenue ramp and would not travel north along Union Avenue
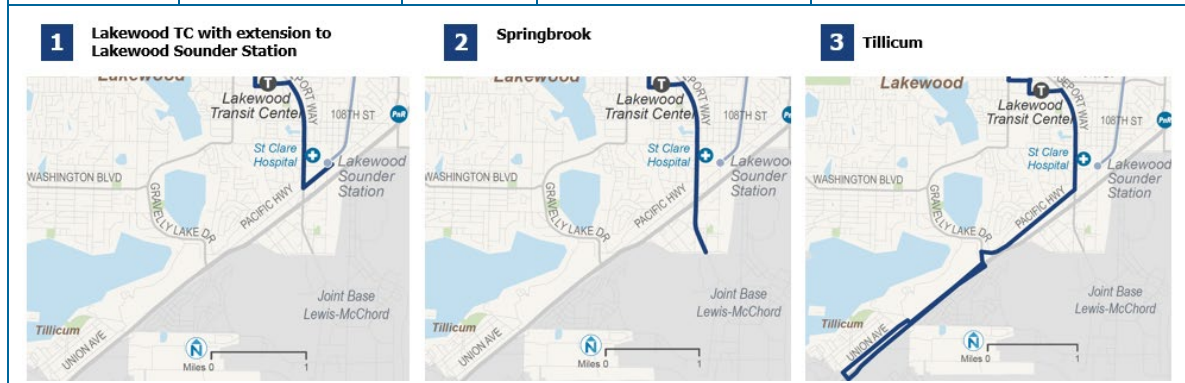
Results

Segment C

Option 1 (Lakewood Transit Center with extension to Lakewood Sounder Station) was selected as the preferred option for the southern end of Corridor A.

Lakewood Sounder Station provides capacity for larger buses and provides regional connectivity with Sound Transit Route 594 with service south to Dupont, as well as north into central Seattle. Additionally, planned future transit-oriented development could prove mutually beneficial for both the development and Stream.

Corridor B

Corridor B Segments

Corridor B Segment A: Alignment Options

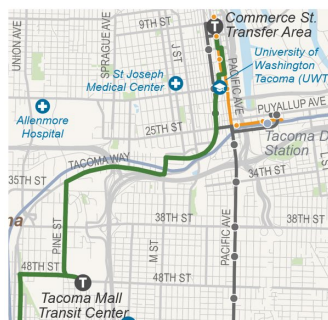| Segment	Extents	Option	Alignment	Description
A	Downtown to Tacoma Mall TC	1	Tacoma Way – Pine Street	Existing alignment (Route 3)
		2a	Pacific Avenue – 38th Street – Tacoma Mall Boulevard	▪ Would serve the Lincoln business corridor ▪ Would share portions of alignment with Stream 1, allowing for high combined frequencies
		2b	Pacific Avenue – 38th Street – Pine Street	▪ Would serve the Lincoln business corridor ▪ Would provide service along Pine Street for neighborhood and business access
		3	Pacific Avenue – 48th Street	▪ Allows easier access to Tacoma Mall Transit Center; bus does not have to go out of direction as it does today ▪ Would share portions of alignment with Stream 1, allowing for high combined frequencies

1 Tacoma Way

2a 38th Street (via Tacoma Mall Blvd)
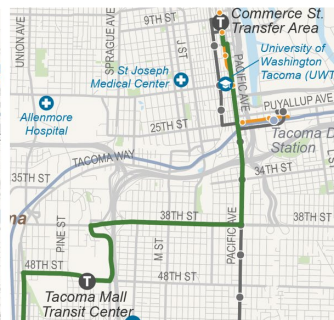
2b 38th Street (via Pine St)
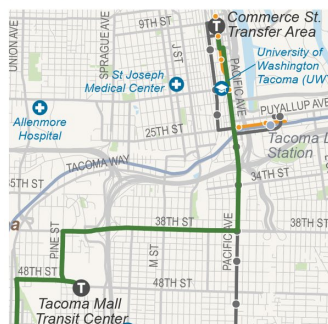
3 48th Street
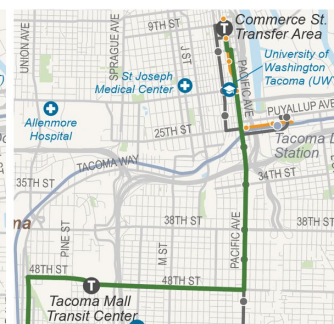
Corridor B Segment B: Alignment Options

Segment	Extents	Option	Alignment	Description
B	Tacoma Mall TC to Steilacoom Boulevard	-	Tacoma Way	No proposed changes

Corridor B Segment C: Alignment Options

Segment	Extents	Option	Alignment	Description
C	Tacoma Way & Steilacoom Blvd to Lakewood TC	1	Tacoma Way – 108th St – Main St – 59th Ave	Existing alignment (Route 3)
		2	Tacoma Way – 100th St – Lakewood Dr – Lakewood Towne Center Blvd	Follows portions of Route 4 alignment
		3	Steilacoom Boulevard – Lakewood Dr – Lakewood Town Center Blvd	Serves Clover Park Technical College
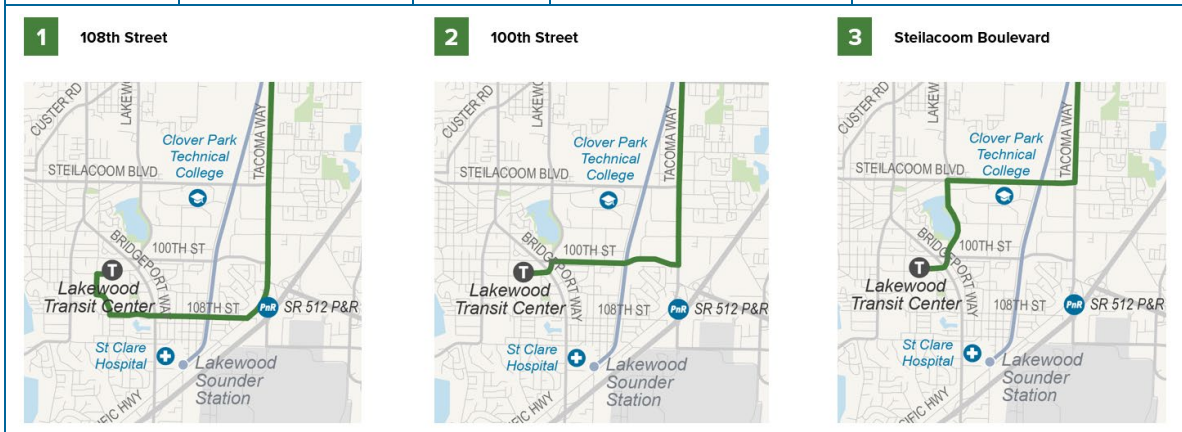
Results

Segment A

Originally Segment A had three options. Following conversations with Pierce Transit staff, a fourth option was added (38th Street via Pine Street). The options most likely to proceed to further evaluation are Option 1 (Tacoma Way), Option 2b (38th Street via Pine Street), and Option 3 (48th Street).

Segment C

Option 1 (108th Street) was selected as the preferred alignment to connect South Tacoma Way with Lakewood Transit Center.

Corridor C

Corridor C Segments
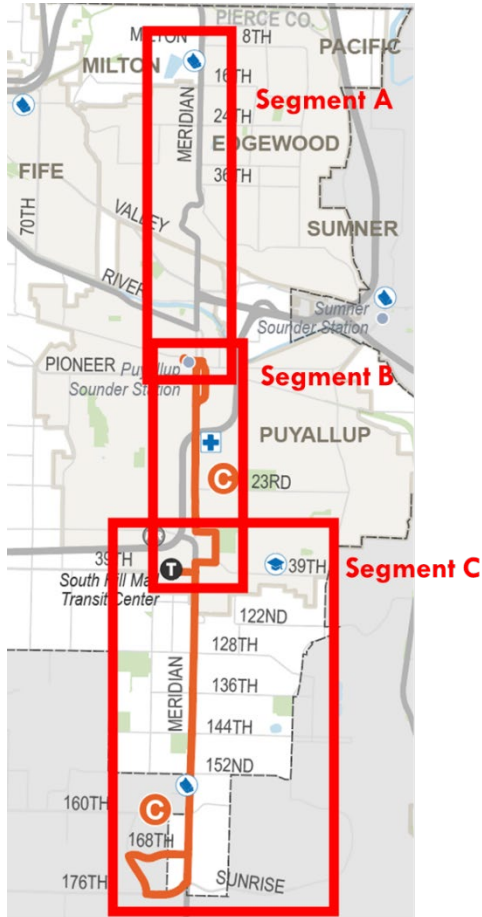
Corridor C Segment A: Alignment Options

Segment	Extents	Option	Alignment	Description
A	Puyallup Station north to Edgewood/Milton (Milton Way/8th St)	-	Meridian Avenue	This extends north of the original SSES corridor proposed by Pierce Transit.

Corridor C Segment B: Alignment Options

Segment	Extents	Option	Alignment	Description
B	Puyallup Station to South Hill Mall TC	-	Meridian Avenue	No proposed changes.

Corridor C Segment C: Alignment Options

Segment	Extents	Option	Alignment	Description
C	South Hill Mall TC to potential southern terminus	1	176th Street / Sunrise Boulevard	Existing alignment (Route 402)
		2	Pierce College	Follows portion of Route 4 alignment.
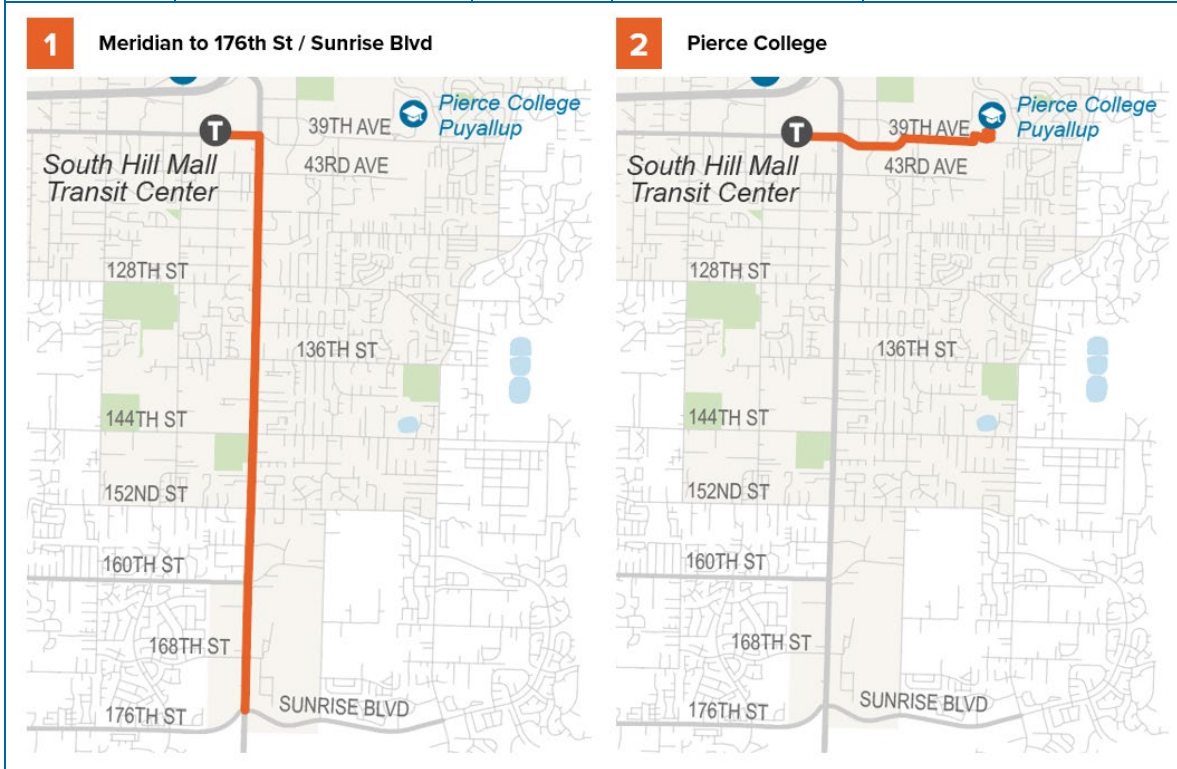
Results

Segment A

Segment A will be removed from the evaluation as the screening analysis indicate the segment scores very low for many of the criteria. The northern terminus of Corridor C will be at Puyallup Station.

Segment C

Option 1 (to 176th Street) was selected as the preferred alignment at the southern end of the corridor.

Corridor D

Corridor D Segments
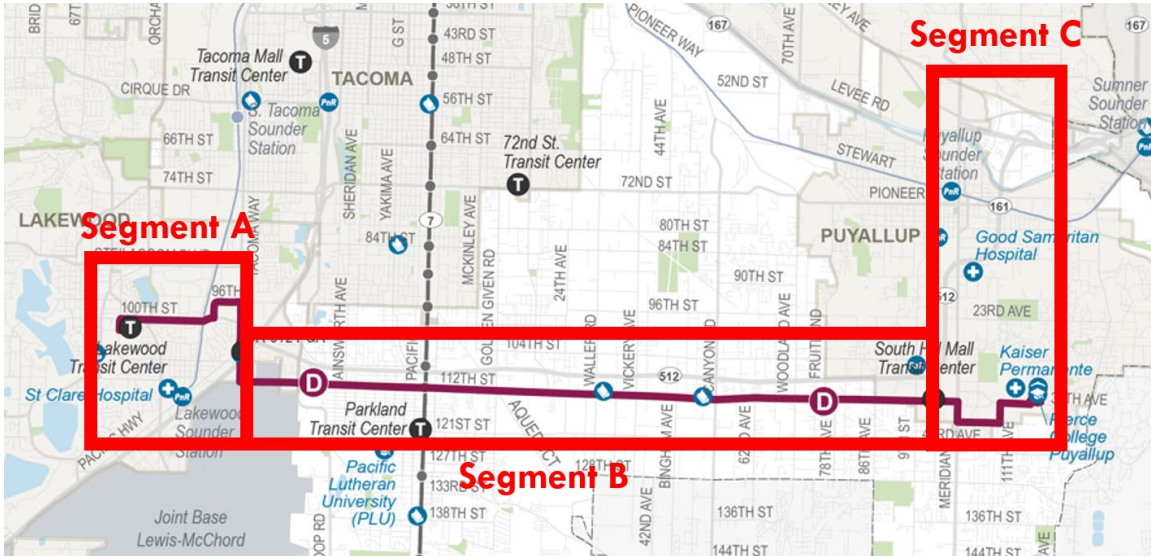
Corridor D Segment A: Alignment Options

Segment	Extents	Option	Alignment	Description
A	Lakewood TC to SR 512 P&R	1	100th Street	Follows Route 4 alignment
		2	108th Street	Follows Route 3 alignment
		3	Pacific Highway	Serves Lakewood Sounder Station
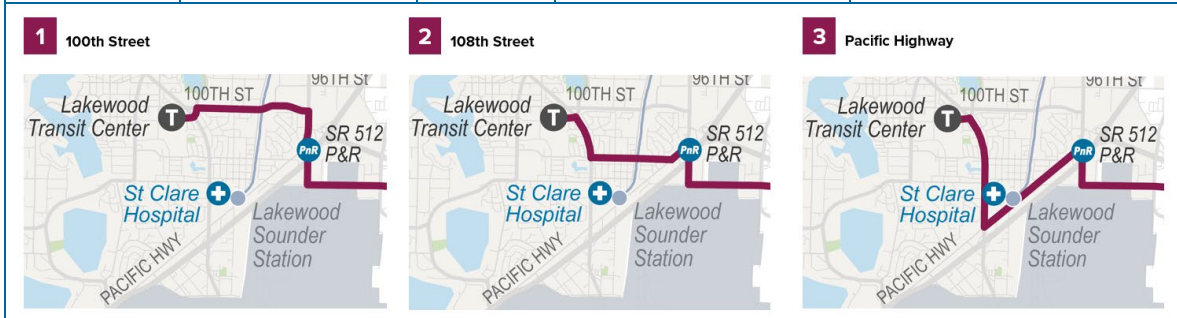
Corridor D Segment B: Alignment Options

Segment	Extents	Option	Alignment	Description
B	SR 512 P&R to South Hill Mall TC	-	112th Street / 39th Avenue	No proposed changes

Corridor D Segment C: Alignment Options

Segment	Extents	Option	Alignment	Description
C	South Hill Mall TC to potential eastern terminus	1	Pierce College	Follows Route 4 alignment
		2	Puyallup Station	Follows Route 402 alignment
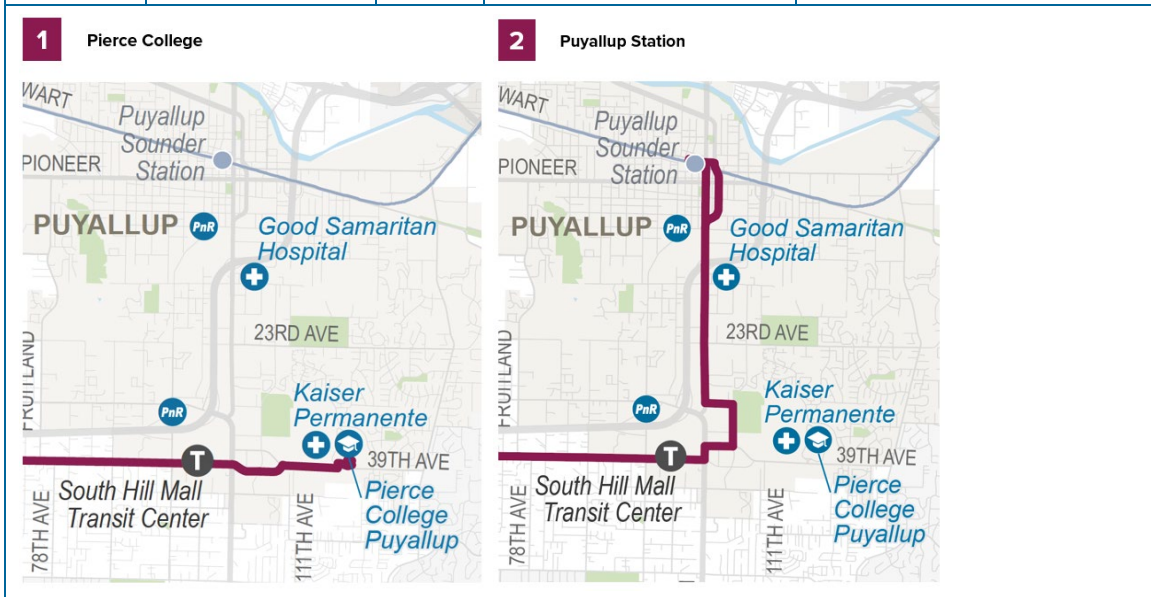
Results

Segment A

Option 1 (100th Street) was selected as the preferred alignment to connect the 112th Street corridor to Lakewood Transit Center. However, the alignment will be modified to use 96th Street between South Tacoma Way and 40th Avenue SW to avoid heavy congestion at the 100th Street and South Tacoma Way signal.

Segment C

Option 1 (Pierce College) was selected as the preferred alignment for the eastern end of Corridor D. This would minimize route duplication that would have occurred with Option 2. Additionally, transfer activity between Routes 4 and 402 show no primary travel pattern from Route 4 to Route 402, as transfers to/from northbound and southbound Route 402 are similar in volume.

SCREENING OF ALIGNMENT OPTIONS

To screen these options into a narrower set for presentation to the TAC, four criteria were applied to each option. The criteria, measures and data sources are summarized in Figure 2 and described in more detail below Figure 2.

Figure 2   Screening Criteria

Criteria	Measure	Data Source
Household and Employment Density	Households per acre (2019)	▪ US Census Bureau ACS 2015-2019 5-Year Estimates ▪ LEHD 2019 ▪ PSRC 2040
	Jobs per acre (2019)	
	Households per acre (2040)	
	Jobs per acre (2040)	
Operations Impacts	Peak fleet requirements	▪ Pierce Transit GTFS (for existing speed and layover time) ▪ Assumed Stream frequency and span
	Daily operating hours	
	Order-of-magnitude passengers per hour	▪ Assumed passengers per capita (based on 2019 ridership from Pierce Transit)
Connectivity to Major Destinations	Number of major destinations or activity centers served (per corridor mile)	▪ Pierce Transit ▪ Pierce County ▪ Local jurisdictions
Equity and High-Need Areas	Number and density of people who live in high-need areas (Equity Index)	▪ Analysis previously completed in Task 2.1 Community Demographics
	Number and density of low-income households in high-need areas (Equity Index)	

- **Household and employment density**: Options serving more people and jobs per acre are more likely to generate higher ridership than those with fewer people and jobs per acre. The overall density of each option was evaluated using a ¼-mile buffer.

- **Operations impacts**: The length of an option has a direct impact on travel time, operating costs, fleet requirements, and reliability. Three measures were used to evaluate alignment options from an operations perspective. Each assumes a hypothetical mini-route serving just the length of the option under consideration:

  – *Peak fleet requirements*: The maximum number of buses that would be needed to run all day on the option (like a hypothetical min-route) assuming the Stream 1 frequencies.

  – *Daily operating hours*: The total daily service hours that would be needed to operate the option assuming the Stream 1 frequencies.

- *Productivity*: Ridership per capita on the existing route was calculated and applied to the new options. The assumed ridership was calculated by multiplying the population along the option with the ridership per capita. This was then divided by the estimated operating hours to estimate productivity.

- **Connecting major destinations**: Stream corridors that connect major destinations with each other and serve many potential trip pairs are most likely to attract and retain ridership. The total number of major destinations or activity centers per corridor mile was calculated.

- **Equity and high-need areas**: Areas with more priority populations[1] indicate greater need for transit investment. Using analysis completed in Task 2.1, segments were assessed based on areas with a high Equity Index (a score of 8 or higher). Two metrics were used:

  - Total number of people who live in high Equity Index areas (or density)

  - Number of low-income households who live in high Equity Index areas (or density)

SCREENING SUMMARY

The summary table in Figure 3 compares the results for each metric within each segment. All metric scores are classified into four categories: limited difference, better scoring, moderately scoring or worse scoring.

All segments located in the middle of a corridor but where there are no options (Segment B in all four corridors) and Segment A in Corridor A were each classified as moderately scoring. Corridor C Segment A is the only other segment at the end of a corridor where there are no options – the current Stream candidate does not go north of Puyallup. This segment is scored compared to the other segments along Corridor C.

Detailed screening results are in the next section.

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[1] Priority populations include non-white or Hispanic, people below 200% of the federal poverty level, foreign-born persons, limited-English speaking households, or people living with a disability.

Figure 3   Summary of Screening

Corridor	Segment	Option	Description	Households	Employment	Fleet Needed & Service Hours	Ridership & Productivity	Major Destinations	High Equity Zones	
									Population	Low-Inc HH
A	A	-	19th Avenue							
	B	-	Bridgeport Way							
	C	1	Lakewood Station					■		
		2	Springbrook							■
		3	Tillicum	■	■	■	■	■	■	■
B	A	1	Tacoma Way	■	■	■	■	■	■	
		2a	38th Street & Tacoma Mall Blvd						■	■
		2b	38th Street & Pine Street				■			
		3	48th Street		■			■		
	B	-	Tacoma Way							
	C	1	108th Street		■	■			■	
		2	100th Street		■					
		3	Steilacoom Blvd	■	■		■	■	■	■
C	A	-	North - Meridian Avenue (to Milton Way)	■			■	■	■	■
	B	-	Central - Meridian Avenue (to Puyallup Station)							
	C	1	176th Street/Sunrise		■		■	■	■	■
		2	Pierce College	■		■	■		■	■
D	A	1	100th Street	■	■					
		2	108th Street		■				■	■
		3	Pacific Highway	■		■	■	■		
	B	-	112th Street							
	C	1	Pierce College		■	■		■		■
		2	Puyallup Station	■		■		■	■	

Legend:
- ■ Limited difference between options
- ■ Better scoring value
- ■ Moderately scoring value
- ■ Worse scoring value

SCREENING RESULTS

The following tables present the detailed results of the screening analysis. A comparison is included for individual options that have an order-of-magnitude value that is different from the other options in its segment.

Household and Employment

Figure 4   Households

Corridor	Segment	Option	Households		Households per Acre		Comparison
			2019	2040	2019	2040	
A	A	-	7,516	19,690	4.4	11.6	--
	B	-	5,713	9,208	2.6	4.1	--
	C	1	1,936	3,117	3.0	4.9	Moderate
		2	2,345	3,696	3.0	4.7	Moderate
		3	3,418	5,688	2.0	3.4	Worse
B	A	1	2,887	8,072	2.7	7.4	Worse
		2a	4,369	11,400	3.5	9.1	Moderate
		2b	4,443	11,179	3.6	9.1	Moderate
		3	4,556	11,076	3.8	9.2	Moderate
	B	-	3,245	5,523	2.7	4.6	--
	C	1	2,368	3,695	2.2	3.4	Moderate
		2	1,652	2,490	2.1	3.1	Moderate
		3	1,526	2,326	1.9	2.9	Worse
C	A	-	1,893	3,120	1.2	2.0	Worse
	B	-	2,653	4,498	2.1	3.5	--
	C	1	2,533	3,666	1.7	2.5	Moderate
		2	1,144	1,780	1.9	3.0	Better
D	A	1	1,411	2,197	2.0	3.1	Worse
		2	1,777	2,909	2.3	3.8	Moderate
		3	2,389	3,780	2.5	4.0	Better
	B	-	4,301	5,739	1.4	1.9	--
	C	1	1,146	1,783	1.9	3.0	Moderate
		2	2,654	4,498	2.1	3.5	Better

Figure 5   Employment

Corridor	Segment	Option	Employment		Employment per Acre		Comparison
			2019	2040	2019	2040	
A	A	-	23,058	38,651	13.6	22.7	--
	B	-	7,651	12,154	3.4	5.4	--
	C	1	2,988	4,390	4.7	6.9	Moderate
		2	3,136	4,552	4.0	5.8	Moderate
		3	3,650	5,378	2.2	3.2	Worse
B	A	1	8,358	13,871	7.7	12.7	Better
		2a	7,832	12,588	6.3	10.1	Moderate
		2b	7,293	11,868	5.9	9.7	Moderate
		3	5,750	9,267	4.8	7.7	Worse
	B	-	5,823	11,445	4.9	9.6	--
	C	1	6,321	9,720	5.8	9.0	Limited difference between options
		2	4,666	7,185	5.8	9.0	
		3	4,247	6,673	5.2	8.2	
C	A	-	3,476	6,405	2.3	4.2	Moderate
	B	-	5,843	9,133	4.5	7.1	--
	C	1	2,328	3,054	1.6	2.1	Worse
		2	2,260	2,775	3.8	4.7	Moderate
D	A	1	4,429	6,601	6.2	9.2	Better
		2	4,672	7,000	6.2	9.2	Better
		3	4,550	6,794	4.8	7.2	Moderate
	B	-	4,441	6,750	1.5	2.2	---
	C	1	2,264	2,779	3.8	4.7	Worse
		2	5,844	9,134	4.5	7.1	Moderate

Operations

Figure 6   Fleet Requirements and Service Hours

Corridor	Segment	Option	Peak Bus Needs	Weekday Service Hours	Comparison
A	A	-	5.5	71.8	--
	B	-	6.9	91.4	--
	C	1	1.8	23.5	Moderate
		2	2.1	27.8	Moderate
		3	6.0	78.8	Worse
B	A	1	3.4	44.8	Better
		2a	4.1	54.3	Moderate
		2b	3.9	51.1	Moderate
		3	3.8	49.6	Moderate
	B	-	3.8	50.2	--
	C	1	3.4	44.8	Worse
		2	2.4	31.7	Moderate
		3	2.4	32.1	Moderate
C	A	-	4.9	64.5	Moderate
	B	-	4.5	58.9	--
	C	1	4.3	56.3	Moderate
		2	1.7	22.0	Better
D	A	1	2.1	27.8	Moderate
		2	2.3	30.2	Moderate
		3	3.0	39.6	Worse
	B	-	10.2	134.2	--
	C	1	1.9	24.9	Better
		2	5.0	66.2	Worse

Figure 7   Assumed Ridership and Productivity

Corridor	Segment	Option	Daily Weekday Ridership (2019)	Productivity (per service hour)	Comparison
A	A	-	1,314	18.3	--
	B	-	868	9.5	--
	C	1	275	11.7	Moderate
		2	319	11.5	Moderate
		3	414	5.3	Worse
B	A	1	358	8.0	Better
		2a	387	7.1	Moderate
		2b	394	7.7	Better
		3	366	7.4	Moderate
	B	-	345	6.9	--
	C	1	320	7.1	Moderate
		2	228	7.2	Moderate
		3	193	6.0	Worse
C	A	-	228	3.5	Worse
	B	-	366	6.2	--
	C	1	230	4.1	Worse
		2	100	4.9	Moderate
D	A	1	349	12.6	Moderate
		2	399	13.2	Moderate
		3	429	10.8	Worse
	B	-	734	5.5	--
	C	1	199	8.0	Moderate
		2	570	8.6	Moderate

Major Destinations

Figure 8 **Major Destinations**

Corridor	Segment	Option	Transit Centers	Grocery & Retail	Medical Facilities	Colleges & Universities	High Schools	Libraries	Total Destinations	Destinations per mile	Comparison
A	A	-	2	2	2	2	1	1	10	1.9	--
	B	-	2	5	-	1	-	1	9	1.3	--
	C	1	2	-	1	-	-	-	3	1.7	Better
		2	1	-	1	-	-	-	2	1.0	Moderate
		3	1	-	1	-	-	1	3	0.5	Worse
B	A	1	1	-	-	-	-	-	1	0.3	Worse
		2a	1	1	-	-	1	-	3	0.8	Moderate
		2b	1	1	-	-	1	-	3	0.9	Moderate
		3	1	-	-	-	-	-	1	0.3	Worse
	B	-	2	1	-	-	-	1	4	1.2	--
	C	1	2	1	-	-	-	-	3	1.0	Moderate
		2	1	1	-	-	-	-	2	0.9	Moderate
		3	1	1	-	1	-	-	3	1.4	Better
C	A	-	1	2	-	-	1	1	5	1.0	Worse
	B	-	2	2	1	-	1	-	6	1.3	--
	C	1	1	4	-	-	-	1	6	1.4	Better
		2	1	-	-	1	-	-	2	1.2	Moderate
D	A	1	2	2	-	-	-	-	4	2.1	Moderate
		2	2	2	-	-	-	-	4	1.9	Moderate
		3	3	3	1	-	-	-	7	2.6	Better
	B	-	2	2	-	-	1	2	7	0.8	--
	C	1	1	-	-	1	-	-	2	1.2	Limited difference
		2	2	2	1	-	1	-	6	1.3	

Equity

Figure 9   Population in High Equity Zones

Corridor	Segment	Option	Population in High Equity Zones	Population Density (per acre)	Comparison
A	A	-	3,338	2.0	--
	B	-	8,673	2.3	--
	C	1	3,086	4.8	Moderate
		2	4,121	5.3	Moderate
		3	4,566	2.7	Worse
B	A	1	3,427	3.1	Better
		2a	1,392	1.1	Worse
		2b	2,671	2.2	Moderate
		3	2,327	1.9	Moderate
	B	-	5,194	4.3	--
	C	1	5,664	5.2	Better
		2	3,489	4.4	Moderate
		3	3,084	3.8	Worse
C	A	-	-	-	Worse
	B	-	3,830	3.0	--
	C	1	3,683	2.5	Limited difference between options
		2	1,520	2.6	
D	A	1	3,272	4.6	Moderate
		2	4,343	5.7	Better
		3	4,435	4.7	Moderate
	B	-	6,362	2.1	--
	C	1	1,524	2.6	Moderate
		2	3,830	3.0	Better

Figure 10   Low-Income Households in High Equity Zones

Corridor	Segment	Option	Low Income Households in High Equity Zones	Household Density (per acre)	Comparison
A	A	1	1,639	1.0	--
	B	-	2,946	1.0	--
	C	1	1,819	1.3	Moderate
		2	2,576	2.9	Better
		3	2,822	3.3	Worse
B	A	1	3,427	1.1	Moderate
		2a	1,392	0.5	Worse
		2b	2,671	0.8	Moderate
		3	2,327	1.0	Moderate
	B	-	1,981	1.7	--
	C	1	2,891	2.7	Moderate
		2	1,624	2.0	Moderate
		3	1,161	1.4	Worse
C	A	-	-	-	Worse
	B	-	1,502	1.2	--
	C	1	930	0.6	Limited difference between options
		2	418	0.7	
D	A	1	1,605	2.2	Moderate
		2	2,363	3.1	Better
		3	2,456	2.6	Moderate
	B	-	2,395	0.8	--
	C	1	420	0.7	Worse
		2	1,502	1.2	Moderate